EXPLORING THE NEXUS BETWEEN DIGITAL ECONOMY DEVELOPMENT, INNOVATION ECOSYSTEMS, AND NATIONAL COMPETITIVENSS: EMPIRICAL EVIDENCE FROM UZBEKISTAN

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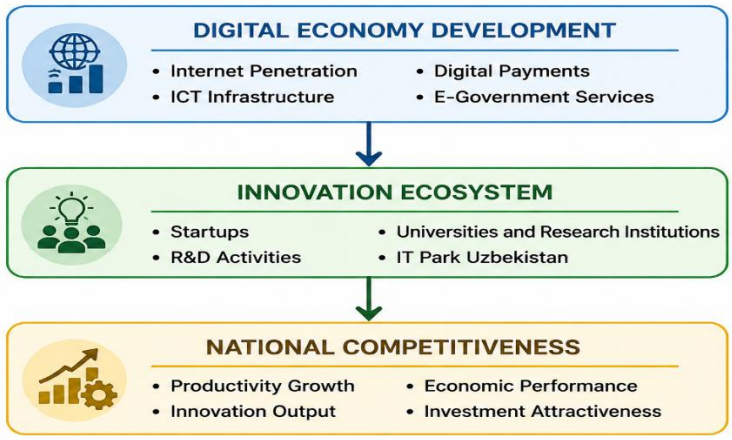
INTRODUCTION

In the 21st century, the digital economy is proving to be one of the most important sources of economic growth, innovation and competitiveness. The development of new information and communication technologies (ICT) and advances in artificial intelligence, cloud computing and digital platforms have changed the way the world produces and become high-tech in business models and public services. The Digitalization has been shown under recent studies to increase productivity, improve market efficiency and provide additional opportunities for the growth of economies, and in particular of emerging economies (OECD, 2024; Bank, 2024). The extensive strategic importance of digital technologies in reaching countries' goal of boosting their economic resilience and competitiveness is also becoming more apparent (OECD, 2024; Bank, 2024) The competitiveness of a country today has a strong influence on the use of digital technology and the conditions for innovation. With the advancement of the digital economy, there have been many new paths for value creation, entrepreneurship and technological development. (UNCTAD, 2024) indicates that digital transformation is increasingly shaping the economic performance and sustainable development of developing countries aiming to optimize productivity and their value and integration into international markets.

The success of innovation ecosystems is closely tied to its benefits of digital transformation. An innovation ecosystem is defined by a collaboration of organizations and individuals within a specific industry or sector, working together to create and market knowledge, which are interconnected. There is recent evidence that it fuels a country's capacity to transform the digital investments into innovation outputs and competitive advantages (Zhang et al, 2024; al, 2024). The success of digital infrastructure investment is not limited to that, but needs to be complemented by investments in innovation skills, knowledge transfer and entrepreneurial support, in order to pave the way for sustainable economic growth. The case of Uzbekistan provides a great example to look at the relationship between digital economy development, innovation ecosystem and national competitiveness. The Digital Uzbekistan–2030 strategy has increased investments in the digital infrastructure, e-government services etc., digital entrepreneurship, exports and digital information. They are focused on helping the country shift towards an economy based on knowledge and to consolidate its role in the area's and the world's digital environments. While significant progress has been made, digital infrastructure development, low, uneven R&D spending and a lack of sufficiently skilled digital professionals and innovation commercialization are still a challenge.

Figure 1. Conceptual Framework of the Relationship Between Digital Economy Development, Innovation Ecosystem, and National Competitiveness



Source: Developed by the author based on OECD (2024), UNCTAD (2024), World Bank (2024), Zhang et al. (2023), and Huang et al. (2024).

In addition, empirical data on the link between the development of the digital economy, innovation ecosystems and national competitiveness in Uzbekistan is not yet extensive. Previous research has been dominated by single-digitization studies or studies that examine innovation alone, with a lack of attention to the role of the interaction between digitalization and innovation in improving competitiveness. Thus, the purpose of the study is to examine the issue of linkage between the development of the digital economy, the innovation environment and national competitiveness in Uzbekistan. In particular, the work explores the role that digital transformation programs and innovations-enabling institutions play in enhancing the country's competitive performance and long-term economic growth.

METHODS

In general, the study involves quantitative descriptive research design and focuses on the relationship between Digital economy growth, innovation ecosystem and competitiveness of the country in the context of Ukraine. This research uses secondary information derived from data from international organizations, government reports and official statistical databases. This method allows a review of the recent trends in digitalization and innovation and how they are impacting the competitiveness of the country. The main period of the study is for the years 2019-2024 – the time of putting into practice key projects of digital transformation as part of the state program Uzbekistan's Digital Uzbekistan-2030. Information was collected via the World Bank, the International Telecommunication Union (ITU), the United Nations Conference on Trade and Development (UNCTAD), the World Intellectual Property Organization (WIPO) and the reports and information from the IT Park Uzbekistan. Three main constructs were examined digital economy development, performance of the innovation ecosystem and national competitiveness.

The indicators for the assessment of the development of the digital economy included internet penetration, ICT infrastructure, digital payment adoption, and e-government development. The performance of the various elements of the innovation ecosystem was assessed by using the indicators of the amount of startups, the support programs of innovation, technology parks and research and development (R&D) initiatives. The innovation output, productivity growth, and the

economic performance indicators were selected as measures for national competitiveness. Collected data was analyzed foes describing and trend analysis.

For summarizing the development of digital economy and innovation indicators descriptive analysis was used and for recognizing trends and changes over time trend analysis was used. Results are reported in tables and figures to be compared with and interpreted. The conceptual framework is based on the assumption that the development of the digital economy improves the performance of innovation ecosystems, thus promoting better national competitiveness. The relationship serves as the basis for this study's analysis and interpretation of the empirical data.

Table 1. Variables and Indicators Used in the Study

Construct	Indicators	Data Sources
Digital Economy Development	Internet penetration, ICT infrastructure, digital payments, e-government services	World Bank, ITU, UNCTAD
Innovation Ecosystem	Startup activity, R&D initiatives, technology parks, innovation programs	IT Park Uzbekistan, WIPO
National Competitiveness	Innovation output, productivity growth, economic performance	World Bank, WIPO

Source: Compiled by the author based on World Bank (2024), ITU (2024), WIPO (2024), and IT Park Uzbekistan (2024).

RESULTS

3.1 Digital Economy Development in Uzbekistan

Uzbekistan's digitalization journey has made substantial strides since 2019, most notably in boosting ICTs' role in the economy. The digital transformation in Uzbekistan has made considerable progress in the period 2019-2024, especially in terms of increasing ICTs' contribution to the economy. Working on the strategy of Digital Uzbekistan – 2030 has positively influenced the access to the internet and to digital public services, the funding of information and communication technology (ICT) initiatives. The investments relating to digital infrastructure have enabled widening connectivity throughout the country, thereby improving opportunities for people's participation in the digital economy. The percentage of people who use the internet has increased significantly during the study period. There has been significant progress made in internet use and access to online services, with more individuals saying that they use the internet in 2024 (89.5%) than in 2019 (70.4%).

Likewise, in Uzbekistan, the performance on digital government has been improved. As per the figures released by the United Nations E-Government Survey, country's E-Government Development Index (EGDI) was 0.6665 in 2020, but on 2024 the country's rank went up to 63rd from 87th in 2020. These are part of the government's attempt to modernize public service and increase the delivery of services online.

Table 2. Selected Digital Economy Indicators in Uzbekistan (2019–2024)

Indicator	2019	2020	2021	2022	2023	2024
Internet Users (% of population)	70.4	71.1	76.6	83.9	89.0	89.5

E-Government Development Index (EGDI)	-	0.6665	-	0.7265	-	0.7999
Global EGDI Ranking	-	87	-	69	-	63

Source: World Bank (2024); UN E-Government Survey (2024).

Data illustrate that digital development indicators are continually improving moving forward. Internet usage has been growing at a very fast pace, indicating its increasing penetration of economic and social activities. Moreover, better performance of e-government services suggest improved access and efficiency of the services, which has a potential to create a more supportive business climate and overall institutional effectiveness.

3.2 Innovation Ecosystem Development

The results also show significant development of the Innovation Ecosystem in Uzbekistan. The country's ability to develop and commercialize Digital solutions has been boosted through Government policies that promote entrepreneurship and technological innovation. It Park Uzbekistan is especially becoming an important player in supporting the development of startups, exports of technological innovations and foreign investments in the ICT sector. The brand-new facts indicate that by 2024, more than 930 companies in Uzbekistan's IT Park had engaged in exporting of digital services, respectively, showing the progression of the internationalization of the technological sector in the country.

The number of technology based firms (TBs) and foreign firms working in the innovation ecosystem has also grown significantly. The development of these are a proof of effectiveness of the government policy aimed at stimulating innovation-powered engine of growth and digital entrepreneurship.

3.3 Digital Economy, Innovation Ecosystems, and National Competitiveness

The findings point to positive indicators between the development of the digital economy, innovation ecosystem performance and competitiveness. Earlier access to information and digital public services have lowered information and transaction costs, and helped to streamline business activities. Meanwhile, growing innovation-enablement institutions, like IT Park Uzbekistan, has led to an increased spirit of innovation and bolstered the country's technology industry. These happenings are part of the efforts of the country to be competitive, by improving productivity, carrying investment and participation in international digital markets.

The results reveal that digital transformation and development of innovation ecosystem act in a double-edged way and promote sustainable economic growth. Building and strengthening digital infrastructure, supporting mechanisms for the sectors, and the development of workers' and professionals' skills will therefore be crucial to keep Uzbekistan competitive in the changing digital economy.

DISCUSSION

The results show that the development of the digital economy and innovation ecosystem positively affect the competitiveness of the nation in Uzbekistan. The penetration of the Internet,

introduction to digital public services and infrastructure of the ICTs reflect the country's progress in the field of digital transformation. These advancements have rendered better information available to improve business practices, increased convenience and provided opportunities for innovation and entrepreneurship. The findings align with recent research by (OECD, 2024) and (Zhang et al, 2024) which have noted digitalization as a factor for innovation and competitiveness in the economy. Knowledge sharing and the access to and use of technology is enhanced through improved digital infrastructure, helping firms and institutions to increase productivity and innovation. Moreover, underlined role of innovation ecosystems in transformational force of digital investments into economic value, due to growth of the IT Park Uzbekistan and startup-supporting programs.

Digitalization and innovation are also reinforcing processes that are suggested in the study. Digital technologies are the base for a modernization of the economy, whereas innovation ecosystems enable new product and service development and commercialization. These all combine to bring about greater productivity, investment appeal and competitiveness for the nation. Luckily, though, there are indications that things are going well, but also challenges, such as low investments in R&D, the scarcity of highly skilled digital workers and the lack of funding opportunities from the venture capital community. Solving these challenges will play a pivotal role in maintaining competitiveness in longer-term and ensuring optimal benefits from the digital transformation in Uzbekistan.

CONCLUSION

The aim of this study was to investigate the correlation between development of a digital economy, innovation ecosystem and the national competitiveness of Uzbekistan. The findings demonstrate that digital infrastructure/Internet connectivity and e-government services have helped facilitate digital transformation in the country. Meanwhile, incubator institutions in support of innovation work, such as IT Park Uzbekistan, have helped to develop entrepreneurship and technologies. The findings suggest that the development of the digital Economy and digitization processes serve to advance the competitiveness of the nation by boosting productivity, fueling innovation and fostering a conducive environment for economic growth.

The results indicate the need to combine and place digitalization and innovation indicators on the agenda to enhance the country's future competitiveness. It is incumbent upon the policy makers to maintain investments in digital infrastructure, building digital skills, research and development and support for startups as a way to continue the progress. A comparative analysis of other Central Asian countries or application of econometric methods could be used in future studies to explore the role of digitalization, innovation, and competitiveness further.

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